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ENDANGERED SPECIES

Technical Bulletin

U.S. Department of the Interior
Fish and Wildlife Service

Fifteen Hawaiian Plants Proposed in May for Endangered Species Act Protection

Fifteen taxa of plants native to the Hawaiian Islands were proposed by the Fish and Wildlife Service on May 24, 1991, for listing as Endangered or Threatened. Fourteen of the 15 are endemic to, or have their largest or best known populations on, the island of Maui. The other species has two recognized varieties, one that is endemic to Maui and one that occurs primarily on O'ahu. All 15 taxa face a variety of threats, the most serious of which are competition with alien plants and habitat damage caused by feral animals.

Maui is formed from the remnants of two large shield volcanoes, the older West Maui volcano and the larger but much younger Haleakala on the east. These mountains and the connecting isthmus formed by lava flows comprise an island 729 square miles (1,888 square kilometers) in area. The highest point on West Maui, Pu'u Kukui, is 5,787 feet (1,764 meters) in elevation. Its average rainfall of 400 inches (1,020 centimeters) per year makes this deeply eroded peak the second wettest spot in Hawaii, and possibly the world. Having erupted as recently as about 200 years ago, Haleakala is much taller (10,023 feet, or 3,055 m) and retains its classic shield shape. Rainfall on Haleakala can be as high as 350 inches (890 cm) per year, but most is received by the windward slope; the crater area, sheltered from moisture-laden winds, is a cinder desert.

These unusual topographical and

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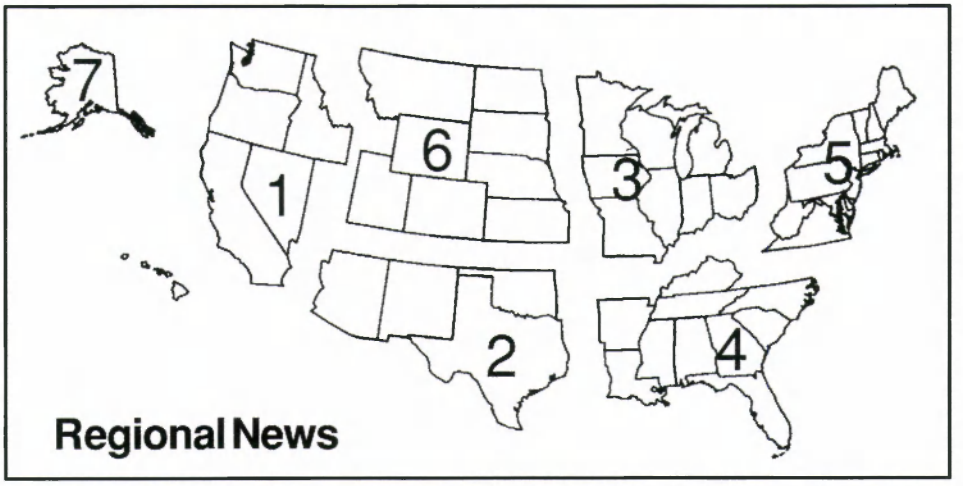
photo by Joan Canfield

The Haleakala silversword grows primarily on barren cinder cones and young lava flows within the volcano's crater at an elevation of 7,200 to 9,800 feet (2,200 to 3,000 meters). Standing next to this specimen is Dr. Robert Robichaux of the University of Arizona, who is studying the evolution and ecology of the Hawaiian silversword alliance.



Regional endangered species staffers have reported the following news:

Region 1 - On May 8, the Fish and Wildlife Service's Sacramento, California, Field Office completed a formal interagency consultation with the Farmers Home Administration (FmHA) under Section 7 of the Endangered Species Act. The consultation regarded a FmHA-funded 13-mile (21-kilometer) water pipeline in Kern County that was proposed by the Lost Hills Utility District. A key issue was the indirect effects of the pipeline on an Endangered plant, the San Joaquin wooly-threads *(Lembertia congdonii)*. A population of this species exists in the utility district's service area, where urban development is expected as a result of the new pipeline. The FmHA agreed to include conditions in its grant deed to the utility district that require reinitiation of formal consultation for any waterline hookups in parcels containing the San Joaquin wooly-threads population. The FmHA also agreed to conduct status surveys for the plant within 5 miles (8 kilometers) of the project vicinity. As a result, the Service determined in its biological opinion that the pipeline would not jeopardize the species' survival.

* * *

The Service's Sacramento Field Office is assisting the National Marine Fisheries Service (NMFS) in its Section 7 consultation with the Bureau of Reclamation on the Sacramento River's Threatened winter run of chinook salmon *(Oncorhynchus tshawytscha)*. The Service recommended to NMFS that it request the Bureau of Reclamation to ensure that river water temperatures do not exceed 56°F (13°C) from June through September between the Keswick Dam and the mouth of Cottonwood Creek in northern California. The Bureau can keep the river water temperatures in the salmon's spawning habitat below the levels that are lethal to salmon eggs by selectively releasing water from Shasta Dam, coordinating Trinity River diversions, or modifying its water deliveries to users downstream on the Sacramento River.

The prognosis for the winter run of chinook salmon in the Sacramento River is poor. As of June 5, only an estimated 150 to 200 adult salmon had returned to spawn.

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Critical Habitat Designation Proposed for the Northern Spotted Owl

The Fish and Wildlife Service proposed in the May 6, 1991, *Federal Register* to designate Critical Habitat for the northern spotted owl *(Strix occidentalis caurina),* which was listed in 1990 as Threatened (see *Bulletin* Vol. XV, No. 7). Over 11 million acres of forest habitat were identified as potential Critical Habitat on all landownerships within the range of the owl. Written comments on the proposal were collected until June 5, and public hearings were held in each of the affected States. Because of the complexity of this issue (designating Critical Habitat for a wide-ranging species and completing an accurate economic assessment for a species that inhabits major timber-producing forests), the Service had decided to repropose designation after review of the initial comments.

Identifying what habitat to include within Critical Habitat boundaries was not an easy task and required considerable judgement on the part of the Service. Such issues as the role of Critical Habitat designations in species recovery, the role of different landownerships in the conservation of the owl, and the economic costs of protecting Critical Habitat are being considered. Upon completion of its review of the comments and an evaluation of potential economic impacts, the Service will publish a revised proposal. There will be a new 60-day comment period with an opportunity for additional public comment, prior to a final decision in December.

Critical Habitat is sometimes an important tool in the conservation of listed species. The term Critical Habitat refers to the specific areas in which the physical and biological features essential to the conservation of a species are found. Critical Habitat designations help to highlight areas that are important to a species, identify important features, and provide guidance for meeting Federal habitat conservation responsibilities under the Endangered Species Act. Although the Act does not specify restrictions on non-Federal lands designated as Critical Habitat, it does place an obligation on Federal agencies. Section 7 of the Act requires Federal agencies to ensure that activities they fund, authorize, or carry out are not likely to jeopardize the survival of a listed species or to destroy or adversely modify its Critical Habitat.

In drafting the Critical Habitat proposal for the northern spotted owl, the Fish and Wildlife Service began with the Habitat Conservation Areas (HCAs) identified by the Interagency Scientific Committee (ISC) authorized by Congress in 1989. Last year, the ISC issued a report (popularly known as the "Jack Ward Thomas report" after the committee's chairman, a Forest Service research biologist). The ISC recommended establishing a system of HCAs totalling almost 8 million acres, within which no harvest was recommended. In addition, the ISC proposal included certain timber management requirements outside its recommended HCA system in order to provide forest conditions that would allow owl movement among the protected zones. This dispersal habitat is provided for under the ISC's "50-11-40 rule," which would require that 50 percent of the forest matrix outside of the HCA's be maintained in stands with trees averaging 11 inches or more in diameter and with at least 40 percent canopy closure.

Using the most current habitat maps available, the Service also identified as potential Critical Habitat other areas within the range of the owl that contain essential features. The Service believes that these new areas, including additions to the HCAs, are needed to address problems in habitat deficiencies or with linkage among owl populations.

Unlike the ISC plan, the proposed Critical Habitat is not a plan for managing the northern spotted owl. A Critical Habitat designation would help to focus attention on areas that need additional protection and that may be important to the recovery of the owl; however, it would not prescribe specific management actions, nor would it identify the management or protection necessary for lands outside of Critical Habitat boundaries that are important for recovery of the owl. Management of such other lands is more appropriately described through the recovery process or other processes.

There is a widespread misconception that a Critical Habitat designation prohibits all activities within specified areas, but that is not the case. It applies only to activities on Federal land or those in which there is some Federal involvement, not activities of a purely private nature. When a proposed Federal action may affect a listed species, the appropriate agency consults with the Fish and Wildlife Service to determine if the activity would be likely to jeopardize the species or adversely modify its Critical Habitat. In the great majority of cases, there is no conflict. For example, if an activity such as precommercial forest thinning or selective logging were found not to adversely modify Critical Habitat, it would not be prohibited under this designation. Critical Habitat differs from the ISC plan in this sense. In cases where there may be problems with a proposed Federal action, the Service works with the involved agency to find "reasonable and prudent alternatives" that would avoid jeopardy or adverse modification while allowing a project to go forward.

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Spotted Owls

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In addition to its team of Service experts on biology, the Service assembled a team of economic analysts to examine the effects of any Critical Habitat designation for the northern spotted owl. In the process of determining Critical Habitat, the Act requires the Service to consider the economic and other impacts resulting from such an action. Areas may be excluded from designation if the costs outweigh the benefits and if the exclusion does not result in the extinction of the listed species. The economic analysis team for the northern spotted owl Critical Habitat proposal includes specialists in forestry and natural resource topics from the Fish and Wildlife Service, Forest Service, Bureau of Land Management, Bureau of Mines, Council of Economic Advisors, and Office of Management and Budget. Their findings are being considered by the Fish and Wildlife Service as it refines the Critical Habitat proposal to meet the intent of the Act.

The revised Critical Habitat proposal will be published in the *Federal Register* in early August 1991. Written comments will then be accepted for 60 days and the Service will hold more public hearings. A final decision on whether or not to designate Critical Habitat, and what the boundaries should be, is due 60 days after the second public comment period closes.

* * *

Meanwhile, under the direction of the Secretary of the Interior, a separate multi-agency team is developing a recovery plan for the northern spotted owl. (See *Bulletin* Vol. XVI, No. 1.) The recovery team is reviewing the ISC report and will address Critical Habitat, but the team has been given a wider responsibility. The ISC plan was prepared before the northern spotted owl was listed as Threatened, and it was not intended to address Critical Habitat or recovery. Under the original ISC recommendations, not all northern spotted owls and their habitat would be protected, only enough to give the owl a high probability for survival over the next 100 years. Under the Endangered Species Act, however, the Fish and Wildlife Service is responsible for not only the owl's survival, but for its recovery to a secure status throughout its range. This team must address all facets of the owl's needs on all landownerships to ensure that recovery under the Act can be achieved.

At the same time, the Service has participated in a congressionally-directed effort to help Jack Ward Thomas and three other eminent scientists create a proposal for an old growth reserve system in the Pacific Northwest. This proposed system is intended to accommodate the needs of listed, proposed, candidate, and other species; preserve the features and processes associated with natural old growth forest ecosystems; and protect some of the remaining old growth forest in the Northwest. Although a Critical Habitat designation would not itself address these other species or forest processes, the Service believes that it will contribute to this goal by helping to focus on important habitat features and values important to natural ecosystems. Focusing on the ecosystem problem in the Northwest will help avoid future conflicts and focus on larger conservation issues.

Regional News

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* * *

Governor Bob Miller of Nevada approved legislation on May 10 authorizing Clark County to purchase and manage lands for the Threatened Mojave population of the desert tortoise *(Gopherus agassizii).* This legislation is a necessary component of the Clark County Habitat Conservation Plan for the desert tortoise because the county did not have the authority to purchase habitat for the conservation of a federally listed species.

* * *

Bird strike incidents involving commercial passenger jets and private aircraft have increased dramatically over the past 2 years at the Lihue Airport on the island of Kaua'i. Most of these incidents have not involved listed species, and no people have been injured to date. However, two Endangered Hawaiian ducks *(Anas wyvilliana)* were killed by collisions with aircraft in recent months, and the number of Hawaiian ducks within a half-mile (0.8-km) of the runways has increased. Although there have been no reports of nene *(Nesochen sandvicensis)* being hit, groups of this Endangered Hawaiian goose as large as 32 have been seen on and adjacent to the runways earlier in May. With perhaps half of the known Kaua'i population of the nene in the vicinity of the airport, the potential for a serious aircraft accident is growing.

* * *

The California condor *(Gymnogyps californianus)* captive populations had another record breeding year in 1991. Eleven pairs of birds (6 pairs at the Los Angeles Zoo and 5 pairs at the San Diego Wild Animal Park) laid 22 eggs, of which 13 successfully hatched—almost double the number of condors that successfully hatched last year (7). The total California condor population now stands at 53, which is almost twice the number of condors in 1987 (27) when the last free-flying bird was captured. With the increase in the population, biologists are optimistic that California condors can be released back into the wild by the end of this year.

* * *

Located approximately 15 miles (24 km) southwest of Chico, California, the 18,000-acre (7,300-hectare) Parrott Ranch contains one of the largest privately owned wetland and riparian complexes still intact in the

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Service Proposes to Reintroduce Black-footed Ferrets into the Wild as an Experimental Population

Black-footed ferrets *(Mustela nigripes),* small, weasel-like carnivores with a black mask, black legs, and a black-tipped tail, once occurred throughout at least 12 western States and two Canadian Provinces, but this species may now be extinct in the wild. Using captive-bred stock, the Fish and Wildlife Service is working with Wyoming biologists to reestablish a wild population of black-footed ferrets in the southeastern corner of the State, bringing this Endangered animal one step closer to recovery.

As proposed in the May 24, 1991, *Federal Register,* 20 or more captive-raised ferrets will be released in the fall of 1991, followed by another 50 or more annually for the next 2 to 4 years. Currently, the preferred release point is a site within the 2,068-square-mile (5,354-square-kilometer) Shirley Basin/Medicine Bow Management Area of southeastern Wyoming. The Meeteetse Management Area in the northeastern part of the State, site of the last known wild population, is being considered as a back-up release point. The initial goal is to reestablish a self-sustaining wild population within 5 years.

The reintroduced ferrets would be managed as a "non-essential, experimental population" under Section 10(j) of the Endangered Species Act. In effect, populations with such a classification basically are treated as if they were listed as Threatened rather than Endangered, although for the purposes of Section 7 they are treated as if they were *proposed* for listing (see details in *Bulletin* Vol. IX, No. 9). This protects them while allowing the Service additional management flexibility, thereby allaying the concerns of landowners who may fear that reintroducing Endangered species could result in restrictions on the use of their property. Approximately 55 percent of the Shirley Basin/Medicine Bow Management Area is privately owned. The voluntary cooperation of landowners in this area will be essential to the success of the reintroduction effort.

The last known wild population of black-footed ferrets was discovered on a ranch near Meeteetse, Wyoming, in 1981 (see feature in *Bulletin* Vol. VIII, No. 3). It suffered a severe decline in 1985-1986 due to canine distemper, a disease that is fatal to ferrets. The last 18 ferrets were collected in 1986-1987 to prevent extinction of the species and to establish a captive propagation program. With the cooperation of the Wyoming Game and Fish Department, efforts to breed and raise black-footed ferrets have been very successful. As of June 1991, the captive population had increased to over 300, and it is still growing. The ferrets are housed at 5 facilities throughout the country, and another two zoos are expected to join the program shortly. This rapidly growing population will provide the animals needed for reintroduction.

Meeteetse had been considered the preferred site for the first reintroduction, but in 1989 its prairie dog population declined more than 50 percent. Black-footed ferrets prey primarily on prairie dogs (*Cynomys* spp.) and use their burrows for shelter and denning. Because of the reduced prairie dog numbers, the carrying capacity for ferrets at Meeteetse also is reduced. Meeteetse will remain under consideration as a future reintroduction site when biological conditions there improve.

Proposed Listings

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climatic features allow Maui to support a rich variety of plant and animal habitats. The 15 species proposed for listing occur in many different vegetation communities (shrublands, forests, bogs), elevational zones (lowland to alpine), and moisture regimes (dry to wet).

If the listing proposal becomes final, Endangered Species Act protection will apply to the following plants:

• ***Argyroxiphium sandwicense* ssp. *macrocephalum,*** known locally as the Haleakala **silversword** or **'ahinahina,** is a single-stemmed shrub in the aster family (Asteraceae). This distinctive plant forms a rosette of narrowly sword-shaped leaves that are up to 13 inches (33 cm) long and covered with a dense mat of silky, silvery hairs. The narrow, branched inflorescence can grow almost 5 feet (1.5 m) tall. Each of the 50-600 flowering heads contains up to 42 pinkish petal-like ray florets and as many as 600 central disk florets, which are pink to wine-red at the tip and yellowish at the base. After flowering once, each plant dies. This taxon occurs only in Haleakala National Park, mainly on barren cinder cones and lava flows within the volcano's crater.

• ***Acaena exigua,*** known in Hawaiian as **liliwai,** is a perennial herb in the rose family (Rosaceae). This small, inconspicuous species reaches only 6 inches (15 cm) in height and produces short, dense spikes of flowers that lack petals. It was known historically from high-elevation bogs on Pu'u Kukui on West Maui and from Mount Wai'ale'ale (the wettest spot in the world) on the island of Kaua'i. Although it has not been observed since 1973, *A. exigua* is believed to survive at a small site on Pu'u Kukui.

• ***Alectryon macrococcus,*** also called **mahoe,** is a tree in the soapberry family (Sapindaceae). It grows to about 36 feet (11 m) tall, has reddish-brown branches, and bears clusters of flowers

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Proposed Listings

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without petals. Two varieties of this species are known: *A. m.* var. *auwahiensis,* consisting of a single population of nine plants in East Maui, and *A. m.* var. *macrococcus,* which occurs on the islands of Maui, Moloka'i, Kaua'i, and O'ahu. The entire species is believed to number no more than about 500 individuals.

• ***Bidens micrantha*** **ssp. *kalealaha,*** or **ko'oko'olau**, is another member of the aster family. An erect perennial herb, it can reach almost 5 feet (1.5 m) in height, growing from sheer rock walls. The yellow flower heads are borne in clusters of up to 50, with each head containing 5 ray florets and 9 to 15 disk florets. Its subspecific name, *kalealaha,* is an anagram of Haleakala, one of the four areas on Maui where this plant still occurs. No more than 2,000 individuals are believed to remain. This plant once occurred on Lana'i, but is apparently extirpated on that island.

• ***Clermontia oblongifolia*** **ssp. *mauiensis,*** or **'oha wai**, is a shrub or tree in the bellflower family (Campanulaceae) that can grow to 23 feet (7 m) tall. The flowers, grouped two or three to a stalk, form an arched tube that is greenish-white or purplish on the outside and white or cream-colored on the inside. Historically, this taxon was found on ridges within wet montane forests on Lana'i and Maui, but it is now apparently restricted to a single site on West Maui. Only one individual of this subspecies is known to remain.

• ***Cyanea lobata,*** another shrub in the bellflower family, is named for its distinctive leaves, which are 12 to 20 inches (30 to 50 cm) long with 12 to 25 irregular lobes along each side. Both *Cyanea lobata* and *Cyanea mceldowneyi* (see below) are in a group of plants known in Hawaiian as haha. The sparsely branched *C. lobata* grows to 7.5 feet (2.3 m) tall. Its flowers, clustered in groups of 5 to 12, have greenish-white or purplish petals fused into a curved tube. This species once occurred on Lana'i and Maui, where it grew on steep stream banks in mesic lowland forests, but the last known population was destroyed recently by a landslide. Botanists hope that additional surveys will locate surviving colonies.

• ***Cyanea mceldowneyi,*** a similar species, is known only from East Maui. The two known populations total fewer than 30 individuals and occupy an area of about 100 square feet (9 sq m).

• ***Cyrtandra munroi,*** or **ha'iwale**, is a shrub in the African violet family (Gesneriaceae). This plant has elliptic to almost circular leaves, covered with velvety, rust-colored hairs underneath, and bears white, tube-shaped flowers in clusters of three. It once grew at scattered locations on Lana'i and West Maui, typically on rich, moist talus slopes in wet lowland forests. Although *C. munroi* was common in the Makamakaole area of West Maui as recently as 1971, it has not been sighted there since. The only known survivor of this species is an individual plant on private land at another West Maui site.

• ***Geranium multiflorum,*** a shrub in the family Geraniaceae, is known in Hawaiian as **nohoanu**. This species is 3.3 to 9.8 feet (1 to 3 m) tall, with oval, toothed leaves, and it produces clusters of up to 50 white flowers that are marked with purple veins or bases. The 11 known populations, all on East Maui, are believed to total no more than 3,000 plants.

• ***Hedyotis coriacea,*** or **kio'ele**, is a small shrub in the coffee family (Rubiaceae) with leathery leaves. Its fleshy, tube-shaped flowers are arranged in small clusters at the ends of the branches. Historically, this species was known from the Wai'anae and Ko'olau Mountains on the island of O'ahu and from the U.S. Army's Pohakuloa Training Area on the island of Hawai'i (the "Big Island"). It typically was found on steep, rocky slopes in dry to mesic shrublands or forests. Considered extinct in recent years, this plant was rediscovered in 1990 on West Maui. One individual is known to remain.

• ***Lipochaeta kamolensis,*** or **nehe**, belongs to the aster family. This perennial herb has trailing or climbing stems that reach a length of up to 10 feet (3 m). Its flower heads, arranged singly or in pairs, are comprised of six yellow ray florets and about 15 disk florets. The only known population occurs in the Kamole Gulch area of Maui, along the bottom of rock ledges in dry to mesic scrub or dry lowland

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Geranium multiflorum

Proposed Listings

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forests. It contains an estimated several hundred individuals.

photo by Carmelle Crivellone

Among the distinguishing characteristics of* Lycopodium mannii *are the species' epiphytic habit and clusters of delicate red stems. This specimen is growing on a koa.

• ***Lycopodium mannii,*** or **wawae-'iole**, is a member of the clubmoss family (Lycopodiaceae). A pendent epiphyte (a hanging plant not rooted in the ground), *L. mannii* typically grows on trees such as 'ohi'a *(Metrosideros polymorpha)* or koa *(Acacia koa)* in mesic to wet montane forests. Its delicate red stems grow to 4 inches (10 cm) long and are lined with rows of tiny, lance-shaped leaves. Historically reported on three islands, this species apparently is extirpated on Kaua'i but remains on Hawai'i and Maui. The 6 known populations total about 35 individual plants.

• ***Lysimachia lydgatei,*** a sprawling shrub in the primrose family (Primulaceae), is distinguished from related species by the dense, rust-colored hairs that cover its leathery, elliptical leaves. Entire flowers of this species have not yet been seen. The only known surviving population was discovered in 1990 on West Maui. It consists of one to several plants on a steep ridge within lowland mesic shrubland.

• ***Melicope mucronulata,*** or **alani**, is a tree in the citrus family (Rutaceae). It grows to about 13 feet (4 m) tall and bears clusters of 3 to 9 flowers. This species typically occurs on steep, dry to mesic, forested lowland slopes. Two populations are known, one on Maui and one on Moloka'i, and they total only five plants.

• ***Schiedea haleakalensis,*** a member of the pink family (Caryophyllaceae), is a shrub 1 to 2 feet (30 to 60 cm) tall with slightly fleshy, narrow leaves. It produces clusters of flowers that have green sepals but lack petals. Named for the mountain on which it occurs, this species is known only from two locations within Haleakala National Park. Both populations, which total 100 to 200 individuals, grow on sheer, arid, subalpine cliffs.

The native vegetation of Maui and the other Hawaiian Islands has undergone extreme alteration as a result of past and continuing land management practices, including deliberate alien plant and animal introductions, agricultural development, and military activities. At this time, habitat degradation by feral animals and competition with exotic plants are the greatest threats to the 15 taxa proposed in May for listing.

photo by Art Medeiros

Schiedea haleakalensis

Feral goats *(Capra hircus)* and cattle *(Bos taurus)* are considered the most damaging non-native vertebrates to Hawaii's native ecosystems. They consume native vegetation, trample roots and seedlings, accelerate erosion, and promote the spread of alien plants. One measure of their impact on plant populations is the response of native vegetation after these animals are brought under control. Until the 1920's, goats and cattle grazed in what is now Haleakala National Park. As a result of the park's feral animal control program, numbers of the Haleakala silversword have increased from a low of between 100 and 1,500 to the current estimate of 50,000 plants. Goats and cattle remain in many other areas, however, including reserves adjacent to the park. Feral pigs *(Sus scrofa)* are another major problem, especially in wet forests.

Six of the 15 recently proposed taxa also are threatened by competition with 1 or more alien plant species. Christmasberry *(Schinus terebinthifolius)*, a fast-growing exotic tree that forms dense thickets, has had particularly harmful impacts. Strawberry guava (*Psidium cattleianum)*, another pervasive alien tree, plagues the wet forests of Maui and other islands. In many areas, native forests were cut down and planted with introduced grasses for cattle pastures. These and many other alien species compete for growing space, light, water, and nutrients, and often prevent the establishment of native plant seedlings.

The small number of populations and of individual plants within each species increases the potential for extinction from a single natural or human-related event. Reduced gene pools also could reduce reproductive vigor. Three of these taxa have declined to only 1 known plant, and 4 others number fewer than 10 individuals.

Due to their severely reduced ranges and populations, 14 of the Maui plants were proposed for listing as Endangered. The Haleakala silversword, which is responding to the control of goats and cattle in Haleakala National Park, was proposed for listing under the less critical category of Threatened.

Final Listing Rules Approved for Four Species

During May 1991, the Fish and Wildlife Service published final listing rules for four species: three plants and one mussel. Endangered Species Act protection is now available to the following:

Leafy Prairie-clover *(Dalea foliosa)*

This rare perennial plant, a member of the pea family (Fabaceae), grows up to 1.5 feet (0.5 meters) tall, has pinnately-compound alternate leaves, and bears dense spikes of small purple flowers. It is known to occur in cedar glades in central Tennessee and northern Alabama, and in remnants of prairie habitat in Illinois. Currently, there are 14 known populations, all of which are relatively small: 2 in Alabama, 3 in Illinois (a fourth site was recently destroyed by a bulldozer), and 9 in Tennessee (2 of which were discovered after the species was proposed for listing; 2 additional sites are slated for development and the populations are expected to be destroyed).

Only four of the 14 populations are being protected by the States or The Nature Conservancy. The remaining sites are threatened by habitat loss or alteration due to residential, commercial, or industrial development; livestock grazing; the conversion of land to livestock pasture; intensive right-of-way maintenance activities; development of a proposed dam; and construction of a proposed highway. All of the populations are vulnerable to the encroachment of more competitive plants and will require long-term management to survive. Although the leafy prairie-clover is readily cultivated, attempts to reintroduce it into the wild have been unsuccessful.

The Service proposed that the leafy prairie-clover be listed as Endangered in the March 27, 1990, *Federal Register* (see *Bulletin* Vol. XV, No. 4), and the final rule was published May 1, 1991.

Northeastern Bulrush *(Scirpus ancistrochaetus)*

A member of the sedge family (Cyperaceae), the northeastern bulrush is a tall perennial herb, growing up to 47 inches (120 centimeters) high, with distinctive arching rays in its inflorescence and barbed bristles on its flowers. It is found in wetlands in hilly country in Virginia, West Virginia, Maryland, Pennsylvania, Massachusetts, and Vermont. The plant also historically occurred in New York. Residential development has destroyed or modified much of the northeastern bulrush's habitat, particularly in the southern portion of its range.

Today, 13 populations remain: 4 in Virginia, 2 in West Virginia, 1 in Maryland, 3 in Pennsylvania (although recent surveys have been unable to reconfirm the plants' presence at 2 sites), 1 in Massachusetts, and 2 in Vermont (although no plants were observed in 1989 and 1990 at one site). Six of the 13 populations are extremely small, each consisting of fewer than 25 plants. Ten of the populations are on private lands and are potentially threatened by residential, agricultural, and recreational development.

The Service proposed the northeastern bulrush for listing as an Endangered species on November 8, 1990 (see *Bulletin* Vol. XV, No. 23), and the final rule was published May 7, 1991. The States of Virginia, Maryland, Massachusetts, and Pennsylvania also list the species as endangered under their own endangered species legislation, while the State of Vermont lists the plant as threatened.

Schweinitz's Sunflower *(Helianthus schweinitzii)*

This perennial herb in the aster family (Asteraceae) grows up to 6.5 feet high (2 meters) and has yellow flowers. It is endemic to the piedmont region of North and South Carolina, where it occurs in clearings and edges of upland woods. Twenty-one populations were reported historically from 10 counties in the 2 States, but approximately one-third of the populations have been extirpated. (Two populations were destroyed between publication of the proposed rule and preparation of the final rule.)

Most of the 13 small populations that remain are in highway or powerline rights-of-way. Over the last 3 years, 6 of these populations have declined from 9 to 89 percent. Almost all of the populations are threatened by habitat alteration due to residential and industrial development, highway construction and improvements, mining, roadside and utility right-of-way maintenance, and the suppression of natural fires and grazing. (Schweinitz's sunflower depends on some form of periodic disturbance to maintain its prairie habitat.)

The Service proposed in the July 2, 1990, *Federal Register* that Schweinitz's sunflower be listed as an Endangered species (see *Bulletin* Vol. XV, No.8), and the final rule was published May 7, 1991. The State of North Carolina also lists this species as endangered, while South Carolina recognizes it as "threatened and of national concern."

Cumberland Pigtoe Mussel *(Pleurobema gibberum)*

This small freshwater mussel has a distinctive shell, with a dark mahogany outer surface and a peach to orange-colored inside surface. It is endemic to the Caney Fork River system, a tributary of the Cumberland River, in Tennessee. Although presumably once widely distributed within the Caney Fork system, the mussel now occurs in short reaches in only four of the river's tributaries:

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Final Listings

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Barren Fork, Calfkiller River, Cane Creek, and Collins River. The Cumberland pigtoe's distribution has been reduced primarily due to impoundments and the deterioration of water quality resulting from coal mining, poor land use practices, and waste discharges. The remaining populations are subject to these same problems.

The Service proposed that the Cumberland pigtoe mussel be listed as Endangered on October 15, 1990 (see *Bulletin* Vol. XV, No. 11), and the final rule was published May 7, 1991.

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Central Valley. The ranch includes a wide diversity of habitats, including sloughs, creeks, riparian habitat, oak woodlands, uplands, valley grasslands, and historic interior wetlands. Several federally listed species and listing candidates occur in the area, including the valley elderberry longhorn beetle *(Desmocerus californicus dimorphus),* bald eagle *(Haliaeetus leucocephalus),* American peregrine falcon *(Falco peregrinus anatum),* and California hibiscus *(Hibiscus californicus).* The ranch also contains important populations of non-listed waterfowl and the sandhill crane *(Grus canadensis).*

The Fish and Wildlife Service, The Nature Conservancy, and the California Department of Fish and Game are preserving a major portion of the Parrott Ranch through a combination of fee title acquisitions and conservation easements. This unique cooperative effort is the largest wetland/riparian conservation project involving Federal and State agencies and a private conservation group ever completed in California. The National Fish and Wildlife Foundation also played a major role in obtaining key funds from private and public sources for the effort.

The Service is acquiring fee title and easements to about 9,300 acres (3,800 ha), which will become part of the Sacramento River National Wildlife Refuge. The Nature Conservancy will manage an additional 3,000 acres (1,200 ha) and the State about 1,600 acres (650 ha) for wildlife. (About 4,000 acres (1,600 ha) of the ranch will remain in private ownership.) With the restoration of the ranch's riparian forest and wetlands, the habitat available to the federally listed species should significantly increase.

* * *

Region 2 - Fish and Wildlife Service biologist Mike Morrow captured greater prairie-chickens *(Tympanuchus cupido)* in Kansas this winter to test facilities and rearing techniques for propagating Attwater's greater prairie-chickens *(Tympanuchus cupido attwateri).* This Endangered subspecies will be propagated at two new sites beginning in 1992. The first captive flock will be maintained at the Fossil Rim Wildlife Center near Glen Rose, Texas. The Center will develop avicultural techniques for maintaining a gene pool for the subspecies, and for propagating and releasing birds into the wild. The second flock will be kept at Hoskins Mound, a subunit of Brazoria National Wildlife Refuge, on the Texas Gulf Coast. Dr. Nova Silvy from Texas A&M University will be rearing birds up to 2 months of age for release on the refuge.

The 1991 population survey of Attwater's greater prairie-chickens indicated 482 birds in 4 areas in Texas—an increase of 3 percent over the 1990 count. (As expected, the small population in Fort Bend County disappeared when the habitat was converted to rice fields.) The largest population, with two-thirds of the total birds in the wild (318), is primarily on private land (O'Conner Ranch) in Aransas, Goliad, and Refugio Counties, with a few birds on the nearby Tatun Unit of Aransas National Wildlife Refuge. However, brush is invading private land between the ranch and the refuge, and will soon separate the refuge prairie-chickens from the other birds. Another population, in Austin and Colorado Counties, contains 126 birds, including about 90 on Attwater's Prairie Chicken National Wildlife Refuge.

About 30 birds survive on a 300-acre (120-hectare) island of prairie habitat in Galveston County, with Galveston Bay on one side and petrochemical plants on the other three sides. Because of its precarious status, this population is viewed as a future source of eggs for building up the propagation flocks at Fossil Rim and Hoskins Mound. Service biologists plan to capture females from the Galveston population in late winter of 1991-1992 and attach small radio transmitters. This will allow biologists to locate nests the following spring and remove eggs early in the incubation period so the hens can renest.

The fourth population is in Victoria County, where about eight birds survive. This site, which is seriously overgrazed by cattle, could recover quickly if the cattle are removed and there is suitable rainfall. This site has been proposed as a second refuge for Attwater's greater prairie-chickens.

* * *

Region 3 - The Indiana/Gray Bat Recovery Team recently met in Columbia, Missouri, as guests of the Missouri Department of Conservation. Summaries were presented of the winter counts of hibernating bats across the range of both Endangered species. Gray bats *(Myotis grisescens),* which spend the summer and winter seasons in two different sets of caves, appear to have a stable, and perhaps growing, population rangewide. Apparently the efforts to protect these bats from human disturbance by placing gates and fences at the cave entrances are proving successful. If cave protection efforts continue and the populations continue to expand, gray bats could be reclassified to Threatened within the foreseeable future.

The picture is less clear for Indiana bats *(Myotis sodalis),* which spend only

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the winter months in caves. Rangewide, the species continues to decline in numbers, although the downward slide appears to have dramatically slowed. In the seven "priority 1" hibernacula that are biennially censused by team leader Rick Clawson, a slight increase was noted in 1991. This is an encouraging sign, compared to the period between 1983 and 1989 when the populations were declining at an average annual rate of 7 percent. The number of Indiana bats is continuing to decline in Missouri, while the winter populations in Indiana and Kentucky appear to be increasing. However, the overall gain in Indiana is due to large increases at only two caves—there are roughly equal numbers of declining and increasing populations in the other Indiana caves.

Because cave protection efforts for the Indiana bat are not yielding the same dramatic increases shown for gray bat populations, the Service is investigating other possible threats to the species. Loss of summer habitat might be an important factor. The effects of environmental contaminants also are being investigated to learn the extent that heavy metals and pesticides are affecting Indiana bat survival and reproduction. There is also concern that small peripheral populations with unusual genetic material may not be receiving sufficient protection. The recovery team has recommended that genetic studies be initiated to determine if these populations warrant special protection.

* * *

Region 4 - The Service and the Geological Survey of Alabama are monitoring known populations and searching for additional populations of the Alabama cave shrimp *(Palaemonias alabamae).* This Endangered species is a small, colorless, and nearly transparent freshwater shrimp known from the subterranean waters of only two caves in north Alabama. Both caves, along with two other wet caves in the immediate vicinity, are being surveyed for aquatic fauna at least once every 3 months. During each visit, the numbers of cave shrimp and crayfish, as well as water levels and quality, are noted. These quarterly observations will continue for 2 years. The study will help determine the current status of the species and provide a baseline for developing a long-term monitoring program. The project is also expected to indicate whether or not additional populations or suitable habitat occur in the karst region surrounding the known Alabama cave shrimp populations. With the assistance of the National Speleological Society, the Geological Survey of Alabama has identified over 200 caves in the vicinity of the two known populations.

During the first 6 months of this study, 21 Alabama cave shrimp were observed on two occasions in one of the 2 caves known to support the shrimp. Twenty-four other caves have been evaluated and although no cave shrimp have been encountered, cave adapted aquatic organisms, including fish and crayfish, have been observed in four caves.

* * *

Louisiana State biologists have been trying since 1968 to reestablish nesting sites for Endangered brown pelicans *(Pelecanus occidentalis carolinensis)* on the coast. One site was at the mouth of the Mississippi River in an area known as South Pass, where biologists were trying to encourage the pelicans to use "mud lumps"—small silt formations that naturally rise 6 to 8 feet (2 to 3 meters) above the surface of the water—for nesting. Last year, pelicans nested in this area for the first time since the early 1960's.

However, on May 30, 1990, 4 men from a commercial fishing vessel stole 83 eggs from all but one of the pelican nests and from numerous laughing gull *(Larus atricilla)* nests. A tip from a concerned citizen, and grants from the Izaak Walton League of America and the National Fish and Wildlife Foundation (which funded necessary operational expenses), led to the arrest by Service law enforcement agents. Although the pelican eggs were recovered, they could not be successfully incubated. Consequently, no young were produced by this colony last year. In addition, the adult pelicans did not return this year to nest. Biologists are uncertain whether or not the pelicans will ever return to the area.

On May 15, 1991, the men were each sentenced to 4 months in prison and 200 hours in community service for violating the Endangered Species Act. (Under the Endangered Species Act, the men could each have been fined up to $100,000 and received a 1-year prison sentence.)

* * *

Region 5 - On May 13, the Environmental Protection Agency (EPA) and the FMC Corporation signed an agreement to phase out the production of virtually all granular formulations of the pesticide carbofuran over the next 3 years. The Service (led by Region 5) and the Virginia Department of Game and Inland Fisheries have expressed concern since 1985 over numerous bird kills due to this pesticide. Service and State biologists documented mortality to bald eagles in Virginia in 1985 and 1986, which caused the EPA to reinitiate Section 7 consultation with the Service under the Endangered Species Act. The resulting biological opinion recommended zones within the nesting area of the Chesapeake Bay bald eagle population within which granular carbofuran should be prohibited. In the meantime, Service Law Enforcement and Endangered Species staffs continued to document mortality to eagles and other migratory birds, and testified at hearings about carbofuran's harmful effects on birds in Maryland and Virginia. The Service's Regional Director also sent several strong letters to EPA urging cancellation of this notorious bird killer.

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The State of Virginia took the first bold step in early May 1991, prohibiting use of the pesticide after June 1, and declaring that re-registration would not be possible. The EPA soon followed with the national restriction described above. Of particular significance to Region 5 is the fact that 9 of its 13 States, including Maryland, Virginia, and Delaware, are considered by the EPA to be "areas of sensitive geography." In these areas, the ban on the use of granular carbofuran will become effective September 1. As Agent Don Patterson from Richmond, Virginia, put it, "The birds are singing sweeter now."

* * *

Recently, 12 pairs of Endangered American burying beetles *(Nicrophorus americanus)* from the laboratory population of Boston University's Biology Department were provided to the Insectarium at the Cincinnati Zoo and Botanical Garden to establish a second captive breeding program. The reintroduction of captive raised beetles into historical habitats is likely to play an important role in the recovery effort for this once wide-ranging species. The only known populations in the wild now occur in Latimer County, Oklahoma, and on Block Island, Rhode Island. Last year, biologists reestablished another population on Penikese Island, in Buzzards Bay, Massachusetts (see *Bulletin* Vol. XV, No. 10).

It was hoped that a second captive breeding program would provide beetles for reintroduction at other sites. However, initial breeding efforts at the Cincinnati Insectarium have been set back due to high beetle mortality. Additional founding stock from Boston University may be provided following a review of holding and breeding methods.

* * *

The Service's New England Field Office, in partnership with the State of New Hampshire and The Nature Conservancy, has been working to conserve the Karner blue butterfly *(Lycaeides melissa samuelis),* a Category 2 listing candidate that occurs in pine barrens. A small population in Concord, New Hampshire, is the only remaining occurrence of this species in New England. Other populations are found in New York and a few midwestern States.

Vegetation control measures implemented last fall at the Concord site opened habitat for the butterfly's obligate larval food plant, wild lupine *(Lupinus perennis),* and seeds collected last summer have been planted in several test plots. If these plantings are successful, the butterfly population should increase.

In March, the Service and conservation groups persuaded the New Hampshire Department of Environmental Services to deny the City of Concord's application to spread municipal sludge over 200 acres (81 ha) of remnant pine barren habitat at the city airport. However, the city failed to find an alternate site and has resubmitted its application to the State. By enriching the soil, the sludge would discourage the growth of pine barren plants and the occurrence of many rare invertebrate animals.

The Service's New England Field Office, the State, and The Nature Conservancy are also continuing to work with the City of Concord to set aside a large area in the airport as a pine barren preserve for the butterfly and other rare species.

* * *

In late April, the U.S. Department of Justice and a private landowner in New York reached a settlement agreement for protecting breeding piping plovers *(Charadrius melodus)* on the landowner's beach. Protracted settlement negotiations took place after the Federal Government sought and obtained a preliminary injunction to protect unfledged chicks on the beach in July 1990. The settlement agreement includes provisions for posting and signing of the plover's nesting areas, institutes special restrictions on the use of vehicles on the beach, and permits access by Service or New York Department of Environmental Conservation biologists or their designated agents to monitor the birds.

* * *

In May, 13 Endangered Delmarva fox squirrels *(Sciurus niger cinereus)* were released in Kent County, Maryland, in an attempt to establish a new population. The 7 male and 6 female squirrels were captured from sites in Dorchester and Queen Annes Counties, where the squirrels are known to be relatively abundant. Although this is the eleventh release of Delmarva fox squirrels in Maryland, it is considered to be an experimental release because the squirrels' movements will be intensively monitored by radio telemetry for several months. This should provide information that will be helpful in designing future releases.

* * *

Region 8 - Scientists at the Service's National Wildlife Health Research Center in Madison, Wisconsin, performed a necropsy on a radio-collared adult male wolf *(Canis lupus)* found dead at Isle Royale National Park, Michigan. The Isle Royale wolf population has been gradually declining in the last few years and has come under increased scrutiny. The primary necropsy finding was that the wolf was severely emaciated, and the condition of its teeth suggests that it was old.

* * *

The first naturally-fertile egg from captive-reared whooping cranes *(Grus americana)* was laid March 7 at the Patuxent Wildlife Research Center in Laurel, Maryland. Although the chick died while hatching, this is still a milestone because the parents (hand-reared in 1985 and 1986) are the first pair in the current captive flock to produce fertile eggs without artificial insemination.

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Patuxent Wildlife Research Center biologists report that the palila *(Loxioides bailleui)* nesting season on the island of Hawai'i (the "Big Island") is continuing at a high level this year. To date, approximately 30 nests have been located, of which 25 are being used by these Endangered birds. This trend is expected to continue.

BOX SCORE
LISTINGS AND RECOVERY PLANS

Category	ENDANGERED U.S.	ENDANGERED Foreign Only	THREATENED U.S.	THREATENED Foreign Only	LISTED SPECIES TOTAL	SPECIES WITH PLANS
Mammals	55	249	8	22	334	31
Birds	73	153	12	0	238	69
Reptiles	16	58	18	14	106	25
Amphibians	6	8	5	0	19	6
Fishes	53	11	33	0	97	49
Snails	4	1	6	0	11	7
Clams	39	2	2	0	43	30
Crustaceans	8	0	2	0	10	5
Insects	13	1	9	0	23	12
Arachnids	3	0	0	0	3	0
Plants	190	1	60	2	256	127
TOTAL	460	484	155	38	1137*	361**

Total U.S. Endangered	460	(270 animals, 190 plants)
Total U.S. Threatened	155	(95 animals, 60 plants)
Total U.S. Listed	615	(365 animals, 250 plants)

* Seperate populations of a species that are listed both as Endangered and Threatened are tallied twice. Those species are the leopard, gray wolf, grizzly bear, bald eagle, piping plover, roseate tern, Nile crocodile, green sea turtle, and olive ridley sea turtle. For the purposes of the Endangered Species Act, the term "species" can mean a species, subspecies, or distinct vertebrate population. Several entries also represent entire genera or even families.

** There are 287 approved recovery plans. Some recovery plans cover more than one species, and a few species have seperate plans covering different parts of their ranges. Recovery plans are drawn up only for listed species that occur in the United States.

Number of Cooperative Agreements signed with States and Territories:	53 fish & wildlife 39 plants
Number of Cooperative Grant Agreements signed for the African Elephant Conservation Act:	7
Number of CITES Party Nations:	110

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ENDANGERED SPECIES

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